Oliva ouini, a new species from Hansa Bay, Papua New Guinea, with notes on the anatomy of *O. oliva* (L., 1758) [1]

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ABSTRACT. *Oliva ouini*, sp. nov. from the Western Pacific Ocean is described and compared to its closest relative: *O. oliva* (L., 1758). The shells of the two species differ by several characters and are completely separable in scatter diagrams. The anatomy of the two species is described and shown to differ for several features.

RESUME. *Oliva ouini*, sp. nov. de l' Ouest de l'Océan Pacifique est décrite et comparée à l'espèce la plus proche: *O. oliva* (L., 1758). Les coquilles des deux espèces diffèrent par plusieurs caractères et sont complètement séparables en diagrammes bivariés. L' anatomie des deux espèces est décrite; elle diffère par plusieurs points.

INTRODUCTION.

Since 1973, the various biotopes of Hansa Bay (Papua New Guinea) have been systematically and repeatedly explored for their *Oliva* fauna. The first specimens of the small species described below were found in May 1992, by SCUBA diving in depths of 6-7 m, around the bow of a small World War II Japanese wreck locally known as the "*Small Awar wreck*". When sifting the sediment with a small hand dredge (mesh: 8 mm), Mr. Jean-Marc OUIN (then Manager of Laing Island Biological Station) noticed that some small, dark *Oliva* were escaping through the mesh. These specimens were unusually fast and agile, re-burying very rapidly in the sediment, in which –being highly cryptic– they vanished if not caught immediately. Albeit quite elusive, the species is not rare around the wreck and, during subsequent years, a total of over 30 specimens has been observed.

The discoverer immediately suggested it was a new species. One of us (BT) was long hesitant because the shells somewhat resemble juveniles of the highly variable *Oliva oliva* (L., 1758), especially the Melanesian variety *longispira* Bridgman, 1906, also present in Hansa Bay. The new form was recognizable at first sight, but so are many local forms of *O. oliva*, a species known to exhibit extreme inter-population differences even within short distances (see TURSCH 1994). The protoconchs are quite similar. The possibility of dealing with an unusual, isolated population of *O. oliva* was increased by the fact that all specimens known at the time were not syntopic with *O. oliva* and came from an area of less than 200 square meters (this objection can now be discarded: the species has recently been found in Vanuatu). So the status of the new species remained long undecided [it was reported as "*species ZHB*" in a study of the *Oliva* of Hansa Bay (VAN OSSELAER *et al.* 1993)].

Although *O. ouini* is easily separated from *O. oliva* (L., 1758) by morphometric analysis of the shell (see below) and lives in another habitat (at least in Hansa Bay), it was felt that study of the soft parts could provide independent evidence of distinct specific status. This would also provide an opportunity of describing the hitherto unknown anatomy of *Oliva oliva* (L., 1758), the type species of the genus *Oliva*. The anatomy of *Oliva* species has indeed been quite neglected so far, excepted for the works of KÜTTLER (1913), MARCUS & MARCUS (1959) and KANTOR (1991).

Family OLIVIDAE Latreille, 1825
Subfamily OLIVINAE Latreille, 1825
Genus *Oliva* Bruguière, 1789.
Oliva oliva (L., 1758).

SHELL.

The shell of *O. oliva* is extremely variable, with the consequence that at least two different species form an "*O. oliva* complex" and are usually confused by authors. Their distinction by morphometric analysis and their geographical distribution have been treated in

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TURSCH, MISSA & BOUILLON (1992). *O. oliva* presents a very large inter-population variation: many populations (even within very short distances) can be easily separated, although the whole set of populations forms one unbroken morphological continuum (see TURSCH 1994). The variability of *O. oliva* is further increased by non isometric growth: the shape of the shell varies with age (see TURSCH 1997). The distribution of shell sizes within one population is very uneven and has been shown to remain constant throughout the year (see TURSCH, OUIN & BOUILLON 1995).

ANATOMY.

17 specimens within the shell length range (H) 11.6-33.4 mm were examined (Table 3). The radulae of 5 specimens were studied by scanning electron microscopy (SEM).

External anatomy. The body of a specimen with H: 15.8 mm consists of 3.75 postnuclear whorls (Pl. 3, Figs. A-B), the mantle cavity spanning *ca.* 1/3 whorl. In alcohol-preserved specimens, the body is pale yellowish, unpigmented. The foot is thin, folding longitudinally during fixation; posteriorly it forms a pouch (Pl. 3, Fig. A - fp). The length of the columellar muscle varies from 1 whorl (specimen H: 15.8 mm) to 1.5 whorls (specimen H: 33.4 mm).

Mantle cavity. Mantle edge even. Mantle rather thick, although the osphradium and the ctenidium are seen through it. Siphon long with smooth edges, extending substantially [33% to 44% L (lip length)] beyond the mantle edge.

Osphradium yellowish, bipectinate, becoming relatively smaller as the animal grows (compare Pl. 3, Fig. D and Pl. 4, Fig. D). It varies from 83% (specimen H: 13.1 mm) to 22% (specimen H: 33.4 mm) of the width and from 84% (specimen H: 12.3 mm) to 62% (specimen H: 33.4 mm) of the length of the large, deeply hanging ctenidium. Osphradium asymmetrical: there are more lamellae on its right side than on the left (Table 3); the total number of lamellae increases as the animal grows. The ctenidium occupies nearly 4/5 of the mantle length. The ctenidium becomes wider and the lamellae become relatively fewer as the molluscs grows (compare Pl. 4, Figs. E and F). Hypobranchial gland moderately glandular, forming very low transverse folds. Anterior mantle tentacle flat, usually much shorter than the siphon. Posterior mantle tentacle not pigmented, short and measuring 15% to 25% of H. Mantle lobe small, concave.

Digestive system. One specimen (male, H 15.8 mm) was preserved with its proboscis everted (Pl. 3, Fig. E). The proboscis is not long (11% of H when contracted to 28% of H when extended), narrow (length/diameter ~ 4.3-8) and lies within the thin-walled proboscis sheath. The proboscis can be highly retracted during invertion, so that the buccal mass (Pl. 5, Fig. E - od) and the radular sac (rs) protrude beyond its posterior end.

Several thin retractor muscles are attached to the middle part of the rhynchodaem (wall of the proboscis sheath) when the proboscis is retracted (Pl. 5, Fig. E - prr). During evertion of the proboscis, the entire length of the rhynchodaem becomes the proboscis walls and the point of attachment of the retractors shifts inside the proboscis.

After the proboscis, the oesophagus is rather narrow and forms a long loop when the proboscis is inverted. During evertion, the loop is completely straightened.

Valve of Leiblein small and poorly delimited from the oesophagus (Pl. 3, Fig. E - vL; Pl. 5, Fig. E), which becomes very narrow to pass through the nerve ring. The nerve ring is large, massive and without visible borders of ganglia (Pl. 3, Fig. E - nr; Pl. 5, Fig. E).

After the opening of the duct of the gland of Leiblein, the posterior oesophagus widens markedly towards the stomach (Pl. 3, Fig. E; Pl. 5, Fig. E - poe).

Gland of Leiblein medium-sized, tubular, coiled, very light-brownish, opens into the oesophagus by a constricted duct which is close to the nerve ring (Pl. 5, Fig. E - dgL) or lies separately on the right side of the foregut (Pl. 3, Fig. E). Salivary glands medium-sized, ramified-tubular, rounded or elongated. Salivary ducts rather thick; shortly after leaving the glands (anteriorly to the valve of Leiblein) they enter the oesophagus walls and pass inside them.

The unpaired small accessory salivary gland is partially embedded in the right salivary gland (Pl. 3, Fig. E; Pl. 5, Fig. E - asg), with a thick duct (dasg) which passes at the right side of the oesophagus.

The radula consists of 132 (specimen H: 12.3 mm) to 184 (specimen H: 23.0 mm) rows of teeth, of which 25-42 rows are not yet completely chitinized. Radula width varies from 0.73% to 1.30% of H (mean: 0.93%; σ: 0.21; n=9). The lateral teeth are of complex shape, typical for the genus *Oliva*: subtriangular, slightly concave plates with narrow base and curved hook-like tips. The basal part of the rachidian teeth has distinct borders; in dorsal view the anterior (directed towards the mouth) edge is clearly convex, semi-elliptical. The rachidian tooth has 3 cusps, the central one being the smallest. In young specimens the cusps are very close to each other (Pl. 8, Figs. 1-3); in larger specimens their spacing slightly increases (Pl. 8, Fig. 4).

The radulae of specimens from two populations in Hansa Bay have been compared: Boro Beach (steep white beach, strong wave action) and Sisimangum Beach (gently sloping black beach, moderate wave action). The two populations are separated by less than one kilometer but their shells are very different: on Sisimangum Beach most specimens are very dark, with short spires while on Boro Beach all specimens are whitish with long spires (see TURSCH 1994). The studied specimens of the Boro Beach population (Pl. 8, Figs. 5-8) appear at first glance to have broader rachidian teeth. This illusion stems from a change in general tooth shape (it is relatively shorter) but the ratio of width to H of the rachidian teeth is practically the same as in the specimens of the Sisimangum population. In the Boro Beach specimens this ratio is 0. 27-0. 33%, while in Sisimangum specimens it is 0.23-

0.31%. The rachidian teeth of the Boro Beach specimens have more widely spaced cusps and present minute serrations between the cusps (Pl. 8, Figs. 7-8). For the moment we do not know if this is an ontogenetic change because we have no young specimens from Boro Beach (where collecting conditions are rough).

Stomach small; its size and shape differ greatly among individuals and probably depend on physiological conditions. The stomach has a rather long caecum and a digestive gland with a single duct, which opens just at the entrance of the oesophagus (Pl. 4, Fig. C; Pl. 5, Fig. F) (the entrance of the oesophagus is not clearly seen on Pl. 4, Fig. C). The stomach has a small posterior sorting area and well pronounced typhlosoles. Anterior sorting area not defined.

Rectal gland absent.

Reproductive system. The gonad, together with the digestive gland, occupies the upper whorls of the visceral mass, starting at the level of the nephridium. The gonad is usually overlaid by the digestive gland and is sometimes not seen from the outside (Pl. 5, Figs. A, D). Penis in mature males is large, simple, terminating in more or less long prong (Pl. 5, Fig. G) which is absent in immature males (Pl. 5, Fig. H). Accelerated growth of the penis probably occurs at a shell length of about 14 mm. A male with H: 13.1 mm still had a penis 0.08 mm long (penis length 0.6% H), while male with H: 14.1 mm already had a penis 6.25 mm long (penis length 44% of H), although not fully formed (Pl. 5, Fig. H). Afterwards, the relative length of the penis remains more or less the same throughout life, or even can become relatively shorter (penis length 34% of H in specimen with H: 25.8 mm; 41% of H in specimen with H: 27.0 mm). The shape changes (appearance of the prong) and the seminal duct become well distinct and visible through the penis walls (Pl. 5, Fig. G). Some males with H: 16.0 mm may still remain immature.

The maturation of the females occurs probably at the same shell size. The smallest mature female seen by us was H: 16.2 mm. It can thus be concluded that *O. oliva* reaches sexual maturity at a shell length of at least 15 mm.

Ontogenetic changes. Besides sexual maturation, the only significant ontogenetic change noticed by us is the relative size of the osphradium and the ctenidium. In young specimens the osphradium has nearly the same size as the ctenidium; it becomes much smaller in grown-up specimens.

Oliva ouini sp. nov.

"*Oliva* sp. ZHB"; Van Osselaer *& al.* 1994: 30.

Type Material.

Holotype (H: 15.62 mm; D: 5.91 mm): Natural History Museum, London [BM(NH)] (Pl. 1, fig. 1).

Paratype 1 (H: 13.50 mm; D: 5.51 mm): Institut Royal des Sciences Naturelles de Belgique, Brussels (I.R.N.S.B.) (Pl. 1, Fig. 2).

Paratype 2 (H: 13.59 mm; D: 5.57 mm): Zoological Museum, Moscow State University (ZMM) n°.Lc 23326 (Pl. 1, fig. 3).

Paratype 3 (H: 13.66 mm; D: 5.64 mm): United States National Museum, Smithsonian Institution (USNM) (Pl. 1, fig. 4).

Paratype 4 (H: 12.91 mm; D: 5.04 mm): Muséum National d'Histoire Naturelle, Paris (MNHN) (Pl. 1, fig. 5).

Paratype 5 (H: 12.05 mm; D: 4.97 mm): Australian Museum, Sydney (Pl. 1, Fig. 6).

Type locality. Hansa Bay, Papua New Guinea (4°10'30" S - 144°52'47" E). Near bow of "Small Awar Wreck", grey sand, 6-7 m.

SHELL.

SIZE: up to about 17 mm.

GENERAL SHAPE: biconical, elongated.

SPIRE: conical, elevated.

PROTOCONCH: greyish-white to dark purplish-grey. Nuclear whorls: mean 3.6. Lower part of last nuclear whorl purple. Transition to teleoconch straight, well defined.

SPIRE WHORLS: profile flat. First postnuclear whorl white. Subsequent whorls with long axial stripes.

FILAMENT CHANNEL: rather narrow, deep, black.

BODY WHORL:

SHELL BACKGROUND: yellowish-cream to whitish.

COLOUR PATTERN: Fine to very fine pattern of brown zigzags, in many cases coalescing into nearly solid brown zones. The shell background is then seen mostly in triangular zones, often coalescing into axial series and commonly delineated with a darker brown line. The zigzag pattern is reinforced by darker chevrons, frequently arranged into axial series. In addition, most specimens have bold dark brown axial lines, following growth lines.

SUBCHANNEL PATTERN: long, dark radial strokes, fainting adapically and often coalescing into a continuous line.

COLUMELLA: somewhat translucent, light purplish grey to flesh, white in faded specimens. 8 to 9 (generally 8) very strong oblique, parallel columellar plications forming regular, rounded columellar teeth.

FASCIOLE: whitish-grey with dark-brown spot at tip.

SUPRAFASCIOLAR BAND: dark grey, patterned with coarse, curved, dark lines in its lower zone, sometimes extending in the upper zone.

APERTURE: chocolate-brown. Inner margin of lip darker. Edge of lip beige. External contour of lip slightly angulate (bulging) near adapical third of aperture. The elongated aperture is rather distant from the filament channel of the previous whorl.

Quantitative data. The meaning of the measurements used in this work is sketched in Figs. 1 and 2. The linear teleoconch measurements H, L, D and LW, the number of nuclear volutions NW and the number of post-nuclear volutions PNW were defined in TURSCH & GERMAIN (1985); the linear protoconch measurement RES5 was defined in TURSCH &

GERMAIN (1986); the linear protoconch measurement PAT17 was defined in TURSCH & GERMAIN (1987).

Some operational quantitative characteristics are given in Table 1. As usual in species belonging to the genus *Oliva* (and contrary to widespread assumption), the most variable character is the relative height of the spire (H-L)/H.

Morphometric separation from *O. oliva*. This was effected by comparing 12 specimens of *O. ouini* (11 with intact protoconch) from the type locality to 100 specimens of *O. oliva* (L., 1758). These 100 specimens include 10 specimens of each of 10 different local populations, covering much of the inter-population variability of the species. At least half of each local sample consisted of shells less then 25 mm in length, to avoid the risk of size-related, artificial separations. The local phena, defined in TURSCH, MISSA & BOUILLON (1992), are: phenon *THA* (W. Thailand), phenon *AO* (W. Australia), phenon *BA* (Indonesia, Bali), phenon *SR* (Sri Lanka), phenon *HB* (Papua New Guinea, Hansa Bay), phenon *WJB* (Indonesia, West Java), phenon *WJA* (Indonesia, West Java), phenon *SJ* (Indonesia, South Java), phenon MB (Papua New Guinea, Milne Bay) and phenon *PA* (Philippines).

O. ouini can be completely separated from the morphological continuum of *O. oliva* (L., 1758). Only two examples will be given here: the scatter diagram of L/LW *vs.* D/H (see Fig. 1) and the scatter diagram of L/PNW *vs.*PAT17/RES5 (see Fig. 2).

The wide dispersion observed for the larger values of L/PNW in Fig. 2 corresponds to the non-isometric growth pattern of *O. oliva*, causing a marked increase of the relative length of the lip in large specimens (see TURSCH 1997).

	mean	min.	max.	S.D.	C.V.
Protoconch (*n* = 11)					
NW	3.59	3.40	3.90	0.180	5.0 %
RES5	1.16	1.13	1.21	0.027	2.3 %
PAT17	0.63	0.58	0.67	0.030	4.7 %
PAT17/RES5	0.54	0.50	0.57	0.023	4.3 %
Teleoconch (*n* = 12)					
D/H	0.40	0.38	0.43	0.015	3.9 %
D/L	0.54	0.53	0.57	0.012	2.2 %
L/H	0.74	0.70	0.78	0.024	3.3 %
L/LW	0.85	0.82	0.87	0.015	1.7 %
(H-L)/H	0.26	0.22	0.29	0.023	8.8 %
log(H)/PNW	0.78	0.75	0.82	0.023	3.0 %

Table 1. Some morphometric characteristics of *O. ouini* sp. nov. All specimens from type locality. S.D.: standard deviation; C.V. : coefficient of variation (100*SD/mean).

Diagnosis. A few easy identification tips are sketched in Pl. 2, Figs. 1,2.

Discussion. At first glance, *O. ouini* is similar in shape to some populations of *O. oliva*. The most obvious difference is the presence in *O. ouini* of 8-9 very strong, oblique columellar plications (see Pl. 1, Figs. 1-6), which are never observed in *O. oliva* (L., 1758) (see Pl. 1, Figs. 10-12) or in the closely related *O. tigridella* Duclos, 1835 (see Pl. 1, Fig. 9). The protoconchs of the two species are very similar (see Pl. 2, Figs. 3, 6) but the ratio PAT17/RES5 is mostly smaller in *O. ouini* (see Fig. 2). For the same size of shell lip, *O. ouini* has generally more postnuclear whorls than *O. oliva* (smaller L/PNW). The external contour of the lip is slightly more angulate.

O. ouini is immediately distinguished by its elongated, biconic body whorl from juveniles of the syntopic species *O. caerulea* (Röding, 1798) (see Pl. 1, Fig. 7) which has a completely different protoconch (see Pl. 2, Fig. 4) and from *O. concinna* Marrat, 1870 which has a somewhat similar protoconch (see Pl. 2, Fig. 5) but differs by many morphometric discriminants (measurements taken on juveniles with H < 25mm, *n*=9), amongst others L/LW (mean 0.93, max. 0.94; min. 0.92; S.D. 0.006; C.V. 0.63 %; compare with Table 1).

ANATOMY.

Four specimens were examined (Table 1). The radulae of two specimens were studied by SEM.

External anatomy. The body of a specimen with H: 11.6 mm consists of 2.5 postnuclear whorls, the mantle cavity spanning *ca.* 2/3 whorl (Pl. 6, Figs. A-B; Pl. 7, Figs. A-C). The live animal of *O. ouini* is yellow-beige, with very contrasting dark brown maculations on all the foot (see Pl. 2, Figs. 7-9). In alcohol-preserved specimens, the body is pale yellowish, siphon, head tentacles and propodium partially speckled with brownish spots. The foot is thin, folding longitudinally during fixation; posteriorly it forms a pouch (Pl. 6, Figs. A, B; Pl. 7, Fig. B, C - fp). The length of the columellar muscle is about one whorl.

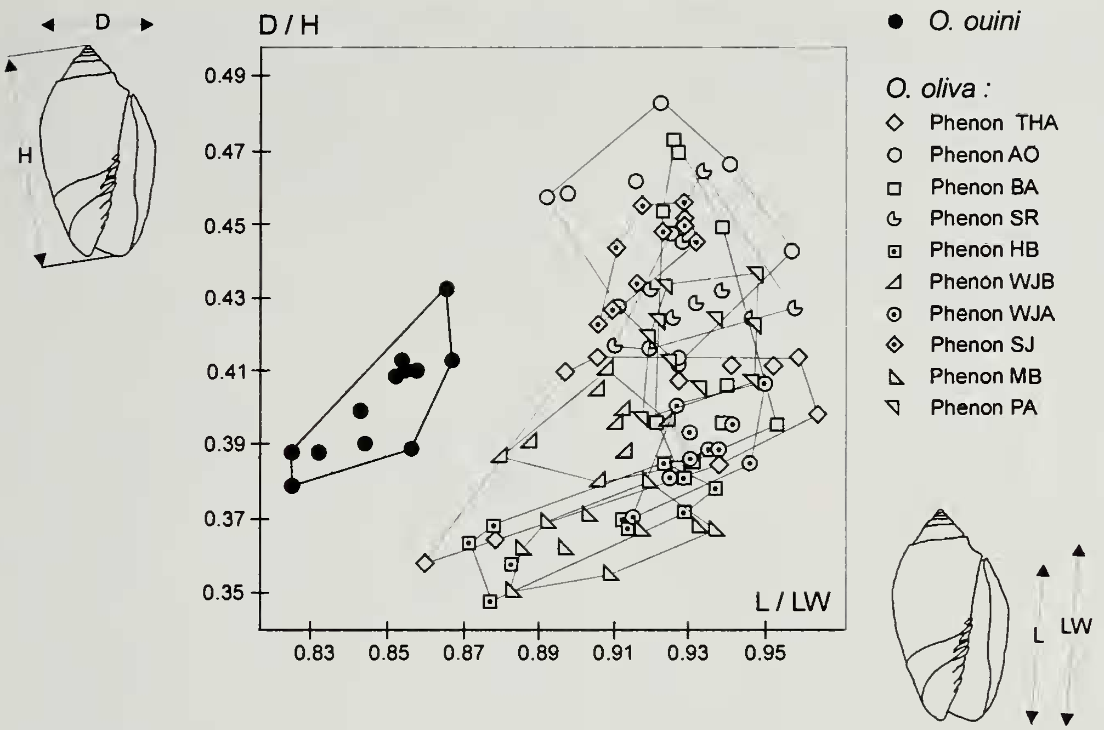


Fig. 1. Morphometric separation of *O. ouini* sp. nov. from *O. oliva* (L., 1758). Scatter diagram of L/LW *vs.* D/H. Minimum convex polygons. See text.

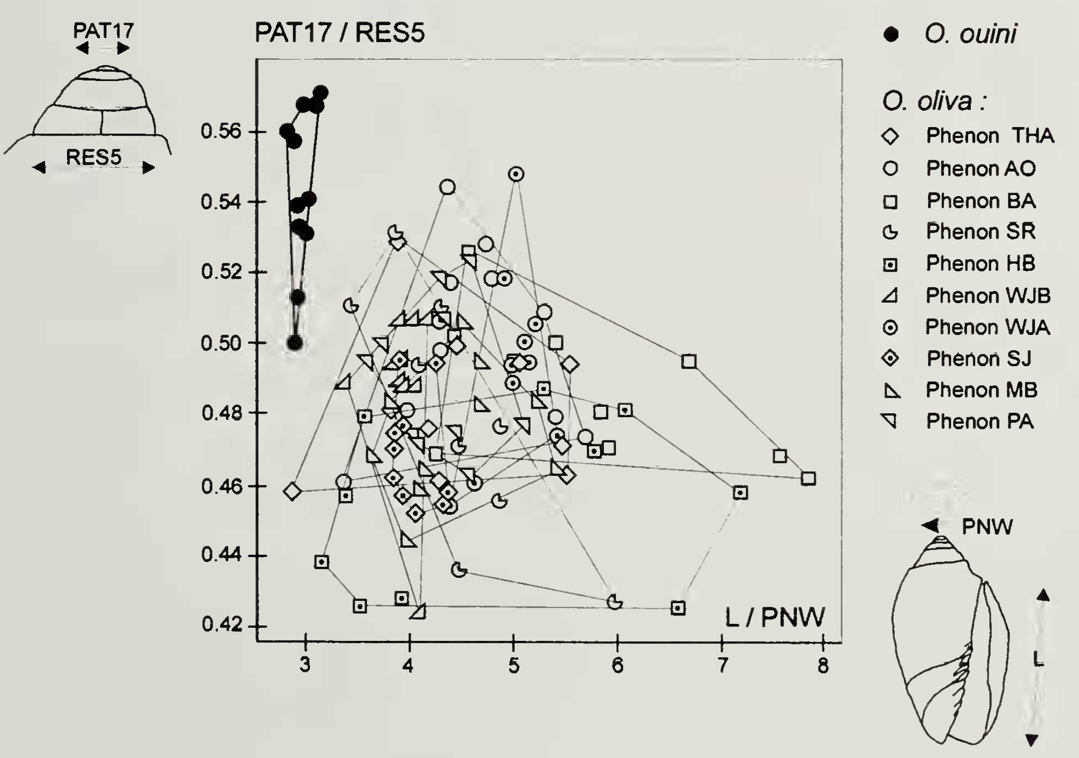


Fig. 2. Morphometric separation of *O. ouini* sp. nov. from *O. oliva* (L., 1758). Scatter diagram of L/PNW *vs.*PAT17/RES5. Minimum convex polygons. See text.

Mantle cavity (Pl. 6, Fig. D; Pl. 7, Fig. E). Mantle edge even. Mantle rather thick, although the osphradium and the ctenidium are seen through it. Siphon long with smooth edges, extending substantially (32% to 40% of L) beyond the mantle edge.

Osphradium yellowish, bipectinate, 55% to 110% (mean: 88%; σ: 0.23) of the width and 74% to 88% (mean: 81%; σ: 0.07) of the length of the large, deeply hanging ctenidium. Osphradium asymmetrical: there are more lamellae on the right side than on the left (Table 2) (in average 54 *vs.* 47). The ctenidium occupies nearly 4/5 of mantle length. Hypobranchial gland moderately glandular, forming very low transverse folds. Anterior mantle tentacle flat, may be nearly as long as the siphon. Posterior mantle tentacle not pigmented, moderately long, about half of the lip length (L). Mantle lobe small, concave.

Rectal gland absent.

shell length, mm	aperture length, mm	number of radular rows	number of forming radular rows	radular width	rachidian width	number of ctenidium lamellae	ctenidium width, mm	ctenidium length, mm	number of osphradium lamellae, left part	number of osphradium lamellae, right part	osphradium width, mm	osphradium length, mm	sex, maturation
11.3	8.5	80	12	0.12	0.04	85	1.0	4.3	45	53	0.9	3.2	♀, mature
11.6	8.6	?	?	0.11	0.04	70	1.0	3.4	41	50	1.0	2.9	♂, mature
11.8	9.0	90	25	0.12	0.03	95	1.8	4.0	50	65	1.0	3.5	♂, mature
13.9	10.1	91	25	0.13	0.05	85	1.2	4.3	46	48	1.3	3.3	♀, mature

Table 2. *Oliva ouini* sp. nov. Summary of some anatomical characters examined. All from type locality.

shell length, mm	aperture length, mm	number of radular rows	number of forming radular rows	radular width	rachidian width	number of ctenidium lamellae	ctenidium width, mm	ctenidium length, mm	number of osphradium lamellae, left part	number of osphradium lamellae, right part	osphradium width, mm	osphradium length, mm	sex, maturation
11.6	8.5	?	?	?	?	87	1.25	4.0	47	62	0.8	3.4	♀, immature
12.3	8.8	132	42	0.16	0.06	90	1.5	4.2	54	65	0.9	3.6	♀, immature
12.8	?	138	25	0.16	0.03	95	?	?	?	?	?	?	?
13.1	9.1	?	?	?	?	?	1.2	3.0	?	?	1.0	2.3	♂, immature
14.1	10.3	146	35	0.13	0.04	95	1.3	3.8	46	60	0.8	3.0	♂, immature
15.8	11.4	174	41	0.13	0.04	90	1.5	4.3	55	60	0.8	3.3	♂, mature
18.5	14.6	158	?	0.15	0.05	?	?	?	?	?	?	?	?
19.2	14.0	?	?	?	?	110	2.2	4.2	62	80	1.0	3.4	♀, mature
19.9	14.4	?	?	?	?	?	2.1	4.2	?	?	1.1	2.8	♀, mature
20.2	14.8	?	?	?	?	105	1.9	5.1	55	60	1.0	3.1	♀, mature
21.8	18.5	175	?	0.16	0.06	?	?	?	?	?	?	?	?
22.0	17.3	?	?	?	?	127	2.7	5.5	55	74	1.2	3.5	♀, mature
22.9	19.2	156	?	0.18	0.07	?	?	?	?	?	?	?	?
23.0	19.7	184	?	0.17	0.06	?	?	?	?	?	?	?	?
25.8	18.6	?	?	?	?	145	3.2	6.1	73	70	1.3	4.5	♂, mature
27.0	19.5	168	41	0.27	0.09	?	?	?	?	?	?	?	♂, mature
33.4	?	?	?	0.28	0.09	185	4.1	10.3	88	100	1.3	7.5	♀ mature

Table 3. *Oliva oliva* (L., 1758). Summary of some anatomical characters examined. Papua New Guinea, Hansa Bay: last two specimens from Boro Beach, all others from Sisimangum Beach.

Digestive system. One specimen (female, H: 13.9 mm) was preserved with its proboscis everted (Pl. 7, Fig. H). Proboscis not long [17% of H when contracted (Pl. 6, Fig. F) to 25% of H when everted], narrow (length/diameter ~ 4.5-7), and lies within the thin-walled proboscis sheath.

The foregut of *O. ouini* is generally very similar to that of *O. oliva*.

The radula consists of 80 (specimen H: 11.3 mm) to 91 (specimen H: 13.9 mm) rows of teeth, of which 12-25 rows are not yet completely chitinized. Radula width varies from 0.91% to1.06% of H (mean: 0.97%; σ: 0.07; n=4). The lateral teeth are very similar in shape to that of *O.oliva*. Rachidian teeth: the lateral sides of the basal part fuse with the subradular membrane and are inconspicuous. In dorsal view, the anterior edges of the basal parts are nearly straight or very slightly concave in the middle. The rachidian teeth have 3 cusps, the central one being the smallest.

Stomach small, with long caecum and single duct of the digestive gland. The shape of stomach differs greatly amongst specimens. We were unable to examine the stomach anatomy.

Reproductive system. The gonad, together with the digestive gland, occupies the upper whorls of the visceral mass, starting at the level of the stomach (Pl. 6, Figs. C, H; Pl. 7, Fig. F - gon). The gonad is not overlaid by the digestive gland. The penis is large, bilobed, with a somewhat flattened basal lobe and a rounded upper lobe which terminates in small curved seminal papilla (Pl. 6, Figs. E, G). The smallest studied specimen (H: 11.6 mm) had a fully formed penis, indicating that the specimen was mature. The smallest studied female (H: 11.3 mm) had large, fully developed pallial gonoduct (Pl. 7, Fig. E - pgon). It can thus be concluded that *O. ouini* reaches sexual maturity at a shell length of less than 11.3 mm.

Comparison with *O. oliva*.
In spite of the general similarity of their anatomy, the two species differ by at least four independent anatomical characters.

1. The radula of *O. ouini* has a significantly smaller number of teeth rows (80-91 *vs.* 132-184 for *O. oliva*, see Tables 2 and 3).

2. The rachidian radular teeth differ in shape: in *O. oliva* the anterior edge is markedly convex (see Pl. 8), in *O. ouini* it is nearly straight and even concave in the middle (see Pl. 9).

3. In *O. oliva* the gonad starts at the level of the nephridium (see Pl. 5, Fig. B); in *O. ouini* it starts at the level of the stomach (Pl. 6, Figs. C,H; Pl. 7, Fig. F).

4. The shape of the penis of *O. oliva* (see Pl. 5, Figs. G, H) is very different from that of *O. ouini* (see Pl. 6, Figs. E, G).

5. The strong maculations seen on the live animal of *O. ouini* are not observed on the body of *O. oliva* which comes in different colours, generally matching the ground colour of the shell (see Pl. 2, Figs. 10-13).

It was also shown that *O. ouini* reaches maturity at a size at least 3.5 mm smaller than *O. oliva*. Other differences (such as the size of the anterior and posterior mantle tentacles) are small and may depend on the conditions of preservation.

OTHER DATA.

Distribution. For years, known only from the type locality, where it is confined to a very small area. The distribution range is in fact much wider. Seven nearly identical specimens originating from Vanuatu [given locality: "Ambre Isl." (error for Ambrym ?),1-3 m] have now been identified in the collection of Mr. J.P. LEFORT (Tahiti) by Dr. Dietmar GREIFENEDER who also has one specimen from Vanuatu, "plage" (2.5 m, black sand).

Habitat. In Papua New Guinea *O. ouini* has been found only in rather calm water, fine grey coral sand, 6-7 m, around one of the ship wrecks in Hansa Bay. It is there syntopic with other *Oliva* species, amongst others *O. caerulea* (Röding, 1798), *O. concinna* Marrat, 1870, *O. reticulata* (Röding, 1798), *O. sericea* (Röding, 1798). In contrast, *O. oliva* is confined to open sand beaches, exposed to occasional strong surf.

In Vanuatu, *O. ouini* is reported from 1 to 3 m depth.

Etymology. This species is named for our friend Jean-Marc OUIN, former manager of Laing Island Biological Station and master in the art of finding elusive *Oliva* species.

Acknowledgements.
We are grateful to the Belgian Fonds National de la Recherche Scientifique (F.N.R.S.) and to BIOTEC, S.A. for supporting our research. We thank Dr. Dietmar GREIFENEDER for much advise.

REFERENCES.

KANTOR, Yu. 1991. On the morphology and relationships of some oliviform gastropods. *Ruthenica* 1(1-2): 17-52.

KÜTTLER, A. 1913. Die Anatomie von *0. peruviana* Lamarck. *Zool. Jahrbuch,* suppl. 13 (Fauna Chilensis): 477-544.

MARCUS, E. & E. MARCUS 1959. Studies on Olividae. *Bol. Fac. Filos. Ciencias e Letras Univ. Sao Paulo,* 232 (Zool. 22): 96-188.

TURSCH, B. 1994. Studies on Olividae XXI. The scale of sympatry in the genus *Oliva*. *Apex* 9(4): 131-142.

TURSCH, B. 1997. Non-isometric growth and problems of species delimitation in the genus *Oliva*. *Apex* 12(2-3): 93-100.

TURSCH, B. & L. GERMAIN 1985. Studies on Olividae. I. A morphometric approach to the *Oliva* problem. *Indo-Malayan Zoology* 1: 331-352.

TURSCH, B. & L. GERMAIN 1986. Studies on Olividae. II. Further protoconch morphometrical data for *Oliva* taxonomy. *Apex* 1(2): 39-45.

TURSCH, B. & L. GERMAIN 1987. Studies on Olividae. V. Five additional protoconch characters for *Oliva* taxonomy. *Apex* 2(3/4): 59-68.

TURSCH, B., O. MISSA & J. BOUILLON 1992. Studies on Olividae XIV. The taxonomic structure of *Oliva oliva* (auct.). *Apex* 7(1): 3-22.

TURSCH, B., J.M. OUIN & J. BOUILLON 1995. On the structure of a population of *Oliva oliva* (L., 1758) in Papua New Guinea (Studies on Olividae 22). *Apex* 10(2/3): 29-38.

VAN OSSELAER, C., J. BOUILLON, J.M. OUIN & B. TURSCH. 1994. Studies on Olividae XVIII. The distribution of *Oliva* species and the variation of their colour patterns in Hansa Bay (Papua New Guinea). *Apex* 9(2/3): 29-46.

Plate 1. Scale bars: 10 mm.

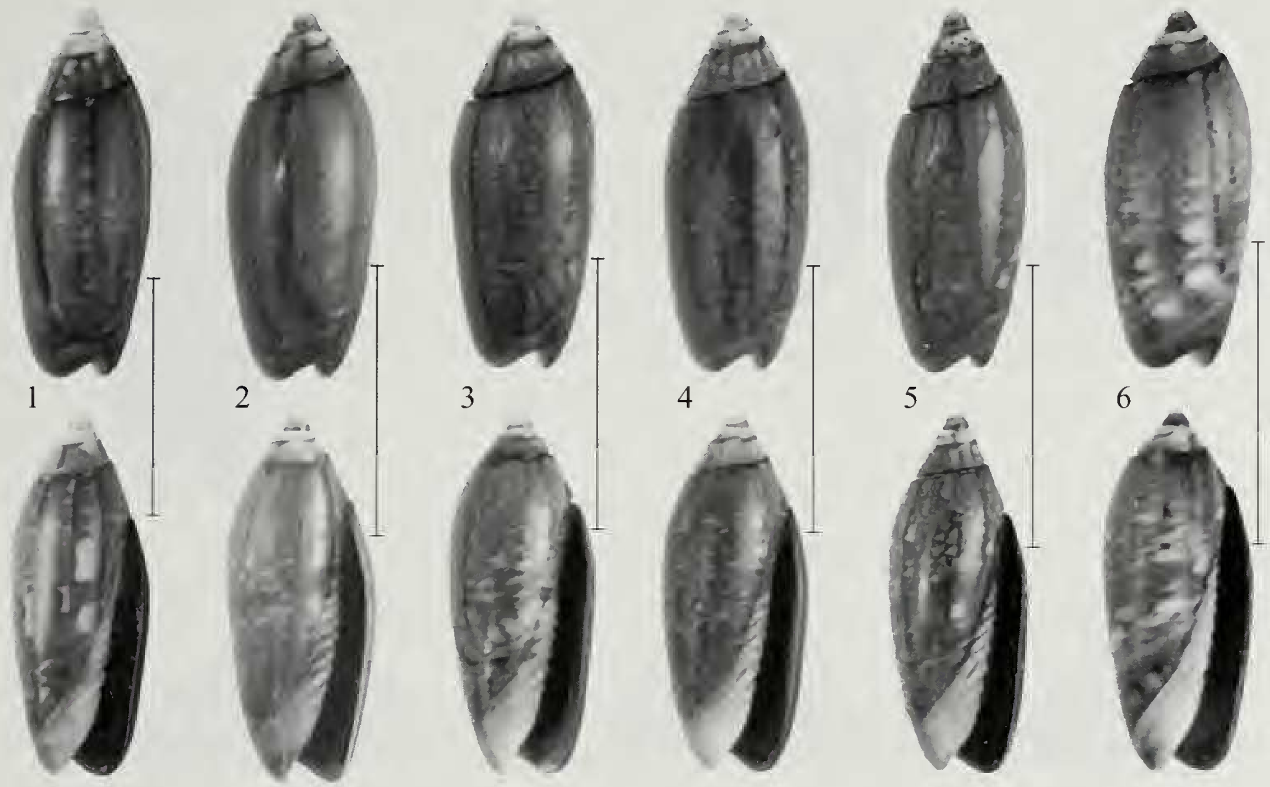
1-6. *O. ouini* sp. nov. All from type locality.
- **1.** Holotype (H: 15.62 mm; D: 5.91 mm): BM(NH).
- **2.** Paratype 1 (H: 13.50 mm; D: 5.51 mm): IRNSB.
- **3.** Paratype 2 (H: 13.59 mm; D: 5.57 mm): ZMM n°.Lc 23326.
- **4.** Paratype 3 (H: 13.66 mm; D: 5.64 mm): USNM.
- **5.** Paratype 4 (H: 12.91 mm; D: 5.04 mm): MNHN.
- **6.** Paratype 5 (H: 12.05 mm; D: 4.97 mm): AMS.

7. *O. caerulea* (Röding, 1798). Juvenile shell (H: 14.77 mm; D: 6.46 mm), found together with *O. ouini*, in type locality.

8. *O. concinna* Marrat, 1870. Juvenile shell (H: 14.82 mm; D: 5.96 mm), found together with *O. ouini*, in type locality.

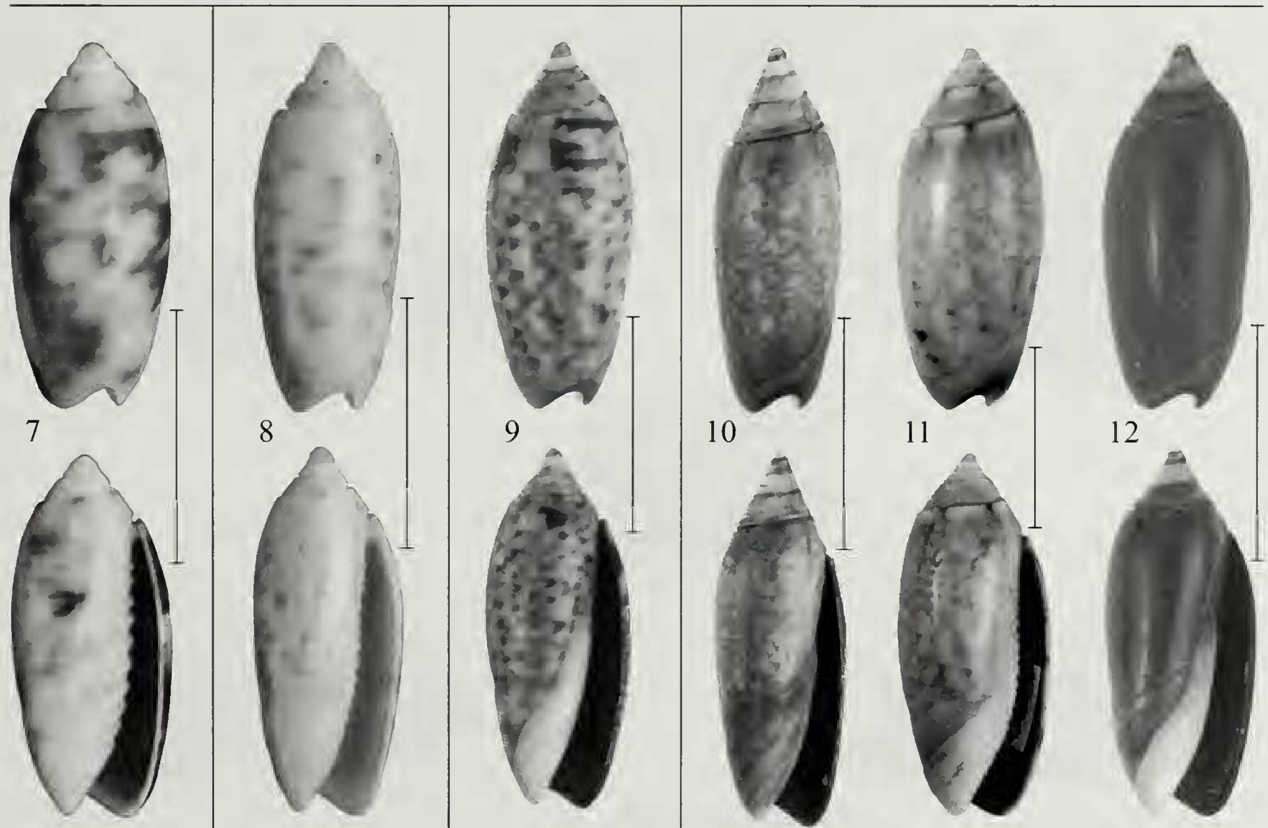
9. *O. tigridella* Duclos, 1840. Juvenile shell (H: 16.84mm; D: 6.77 mm), Philippines, Cebu.

10-12. *O. oliva* (L., 1758).
- **10.** Juvenile shell (H: 15.81 mm; D: 5.77 mm), Papua New Guinea, Hansa Bay, Sisimangum Beach, low tide.
- **11.** Juvenile shell (H: 19.92 mm; D: 8.33 mm), Vietnam, Nha Trang, Hon Tre Is., low tide.
- **12.** Juvenile shell (H: 15.66 mm; D: 6.43 mm), Sri Lanka, Welligama, low tide.



holotype paratype 1 paratype 2 paratype 3 paratype 4 paratype 5

O. ouini sp. nov.



O. caerulea *O. concinna* *O. tigridella* *O. oliva*

Plate 2.

1-3. ***O. ouini*** sp. nov. All from type locality.
  1.-2. Tips for quick shell recognition.
  3. Protoconch.

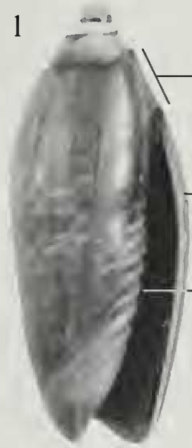
4. ***O. caerulea*** (Röding, 1798). Protoconch. Juvenile shell (H: 14.77 mm; D: 6.46 mm), found together with *O. ouini*, in type locality.

5. ***O. concinna*** Marrat, 1870. Protoconch. Juvenile shell (H: 14.82 mm; D: 5.96 mm), found together with *O. ouini*, in type locality.

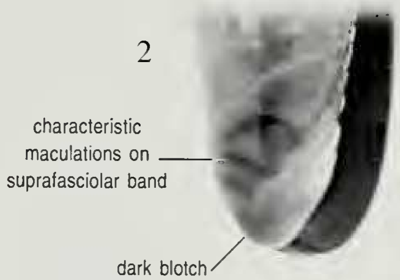
6. ***O. oliva*** (L., 1758). Protoconch. Juvenile shell (H: 15.81 mm; D: 5.77 mm), Papua New Guinea, Hansa Bay, Sisimangum Beach, low tide. Juvenile shell (H: 15.81 mm; D: 5.77 mm), Papua New Guinea, Hansa Bay, Sisimangum Beach, low tide.

7-9. ***O. ouini*** sp. nov. Live animals. All from type locality.

10-13. ***O. oliva*** (L., 1758). Live animals, different colour forms, all from Papua New Guinea, Hansa Bay, Sisimangum Beach, low tide.

1


O. ouini

2


O. ouini

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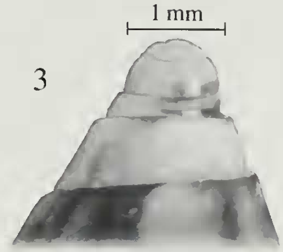

O. ouini

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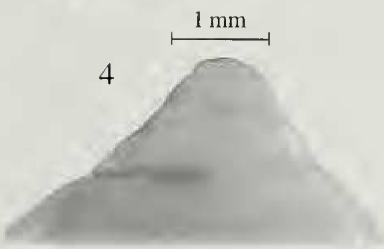

O. caerulea

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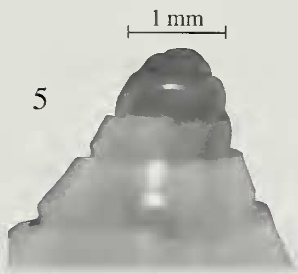

O. concinna

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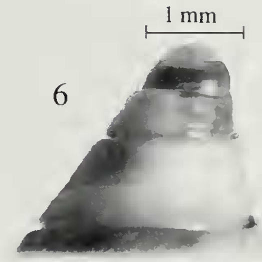
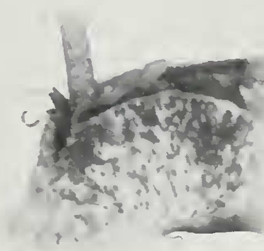


O. oliva

7

O. ouini

8

O. ouini

9

O. ouini

10

O. oliva

11

O. oliva

12

O. oliva

13

O. oliva

Plate 3. Anatomy of *O. oliva* (L., 1758).

Specimen(♂ H 15.8 mm) from Papua New Guinea, Hansa Bay, Sisimangum Beach.

Scale bars: A, B - 2 mm, C-F - 1 mm.

A, B - body removed from the shell.

C - view of visceral mass, showing the shape of stomach.

D - cut-out mantle.

E - anterior part of digestive system from the right side with the proboscis everted, extended.

F - native position of the gland of Leiblein and salivary glands, from the left anterior side.

amt - anterior mantle tentacle
ao - anterior aorta
asg - accessory salivary gland
cm - columellar muscle
cme - cut mantle edge
ct - ctenidium
dasg - duct of accessory salivary gland
ddg - duct of digestive gland
dg - digestive gland
dgL - duct of gland of Leiblein
fp - pouch of foot
gL - gland of Leiblein
gon - gonad
hg - hypobranchial gland
ml - mantle lobe
nr - nervous ring
os - osphradium
par - parapodium
pen - penis
pmt - posterior mantle tentacle
poe - posterior oesophagus
pr - proboscis
prp - propodium
re - rectum
s - siphon
sd - salivary duct
sg - salivary gland
st - stomach
vL - valve of Leiblein

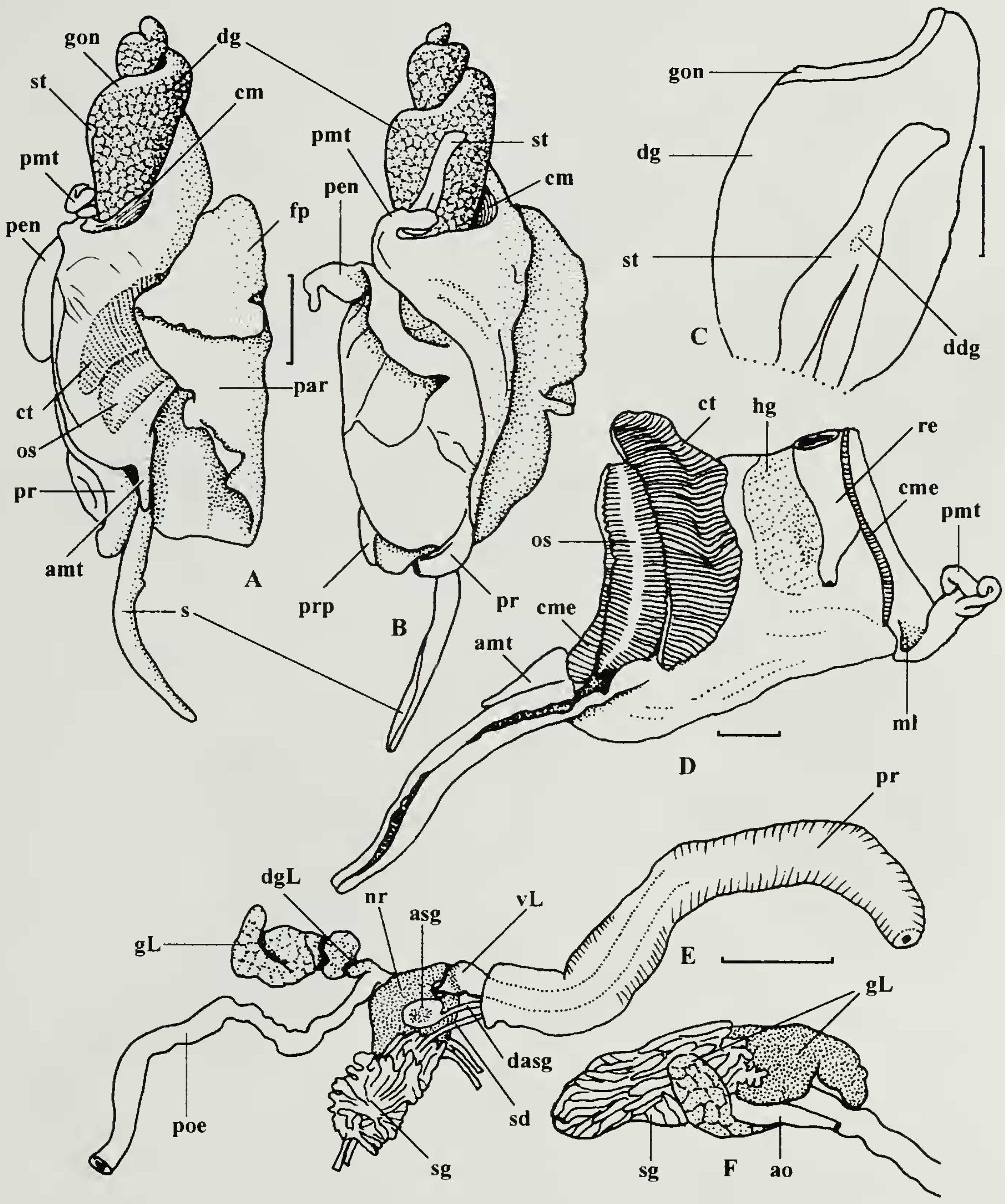


Plate 3. *Oliva oliva* (L., 1758)

Plate 4. Anatomy of *O. oliva* (L., 1758).

A-D -Specimen (♀ H: 33.4 mm) from Papua New Guinea, Hansa Bay, Boro Beach.
Scale bars: A, B, D - 5 mm, C - 2 mm, F - 1 mm, E - 0.5 mm.

A, B - body removed from the shell.

C - stomach, opened dorsally.

D - cut-out mantle.

E - Shape of ctenidium lamellae. Specimen (H: 13.1 mm) from Papua New Guinea, Hansa Bay, Sisimangum Beach.

F - Shape of ctenidium lamellae. Specimen (H: 22.0 mm) from Papua New Guinea, Hansa Bay, Sisimangum Beach.

amt - anterior mantle tentacle
c - caecum of the stomach
cm - columellar muscle
cme - cut mantle edge
ct - ctenidium
ddg - duct of digestive gland
dg - digestive gland
gon - gonad
ht - head tentacles
ig - intestinal groove
ml - mantle lobe
oe - oesophagus
os - osphradium
pgon - pallial gonoduct
pmt - posterior mantle tentacle
prp - propodium
psa - posterior sorting area
re - rectum
s - siphon
st - stomach
t - typhlosoles

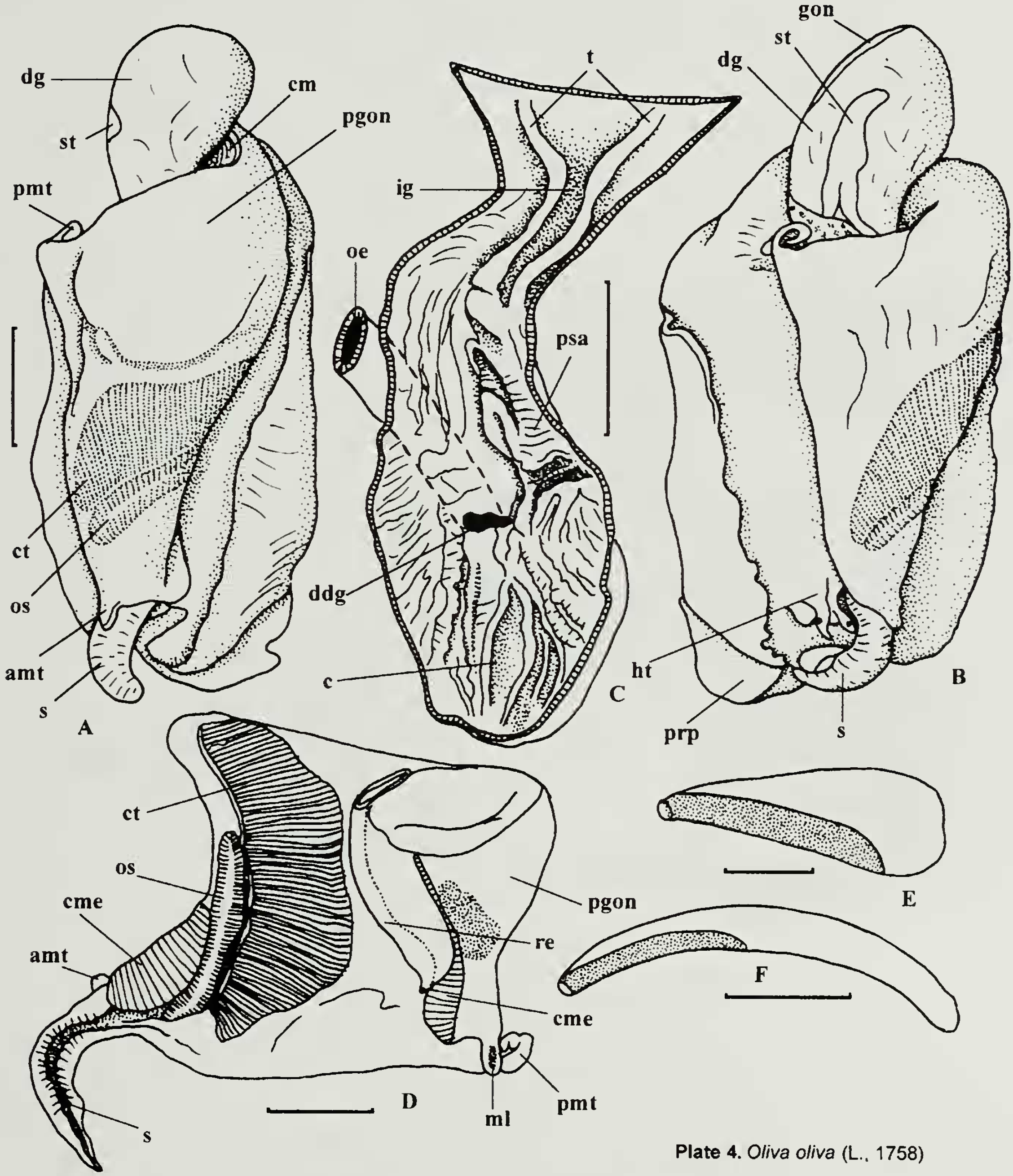


Plate 4. *Oliva oliva* (L., 1758)

Plate 5. Anatomy of *O. oliva* (L., 1758). Scale bars: A,B - 2 mm, C-F - 1 mm.
Specimens from Papua New Guinea, Hansa Bay, Sisimangum Beach.
A, H - (♂ H: 14.1 mm) (drawn to the same scale).
B, E - (♀ H: 11.43 mm) (drawn to the same scale).
C,F,G - (♂ H: 25.8 mm).
D - (♂ H: 19.2 mm).
Scale bars: 1 mm.

A-D - views of visceral mass, showing variability of the shape of stomach.

E - anterior part of digestive system from the right side, extended.

F - stomach, opened dorsally.

G, H - ontogenetic changes of the penis shape and size.

asg - accessory salivary gland
c - caecum of the stomach
ddg - duct of digestive gland
dg**L** - duct of gland of Leiblein
g**L** - gland of Leiblein
gon - gonad
ig - intestinal groove
nr - nervous ring
od - odontophore
ooe - opening of oesophagus into stomach
poe - posterior oesophagus
pr - proboscis
prr - proboscis retractors
psa - posterior sorting area
rhd - rhynchodaeum (proboscis sheath)
rs - radular sac
sg - salivary gland
t - typhlosoles
vL - valve of Leiblein

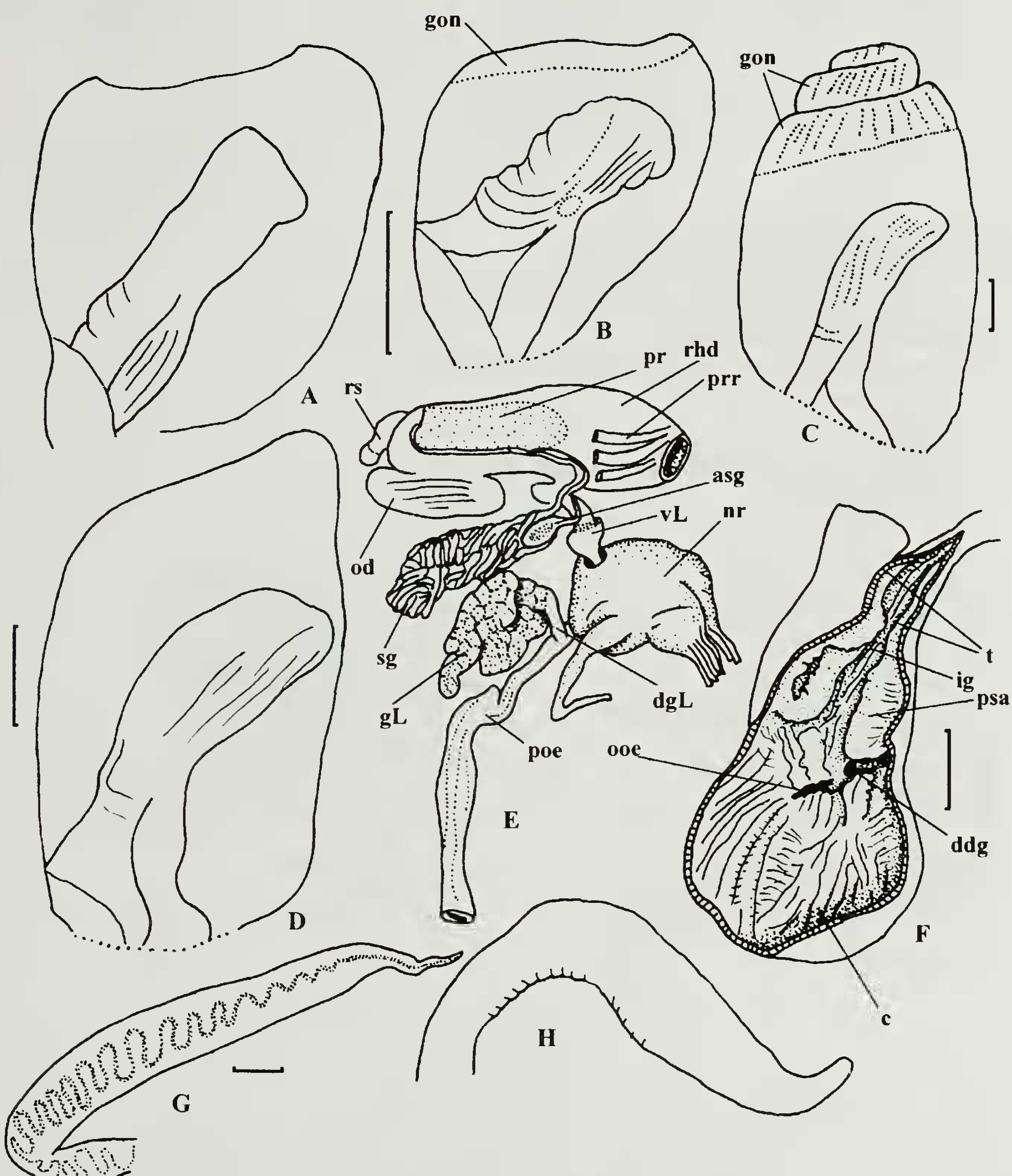


Plate 5. *Oliva oliva* (L., 1758)

Plate 6. Anatomy of males of *Oliva ouini* sp. nov.

A-F: (♂ H: 11.6 mm); G-H: (♂ H: 11.8 mm).

Scale bars: A,B - 2 mm; others - 1 mm. C, F, H drawn to the same scale.

- **A,B** - body removed from the shell.
- **C,H** - view of visceral mass, showing the shape of stomach.
- **D** - cut-out mantle.
- **E, G** - penis.
- **F** - anterior part of digestive system from the right side, extended. Proboscis inside the rhynchodaeum is shown by dotted line.

amt - anterior mantle tentacle
asg - accessory salivary gland
cm - columellar muscle
cme - cut mantle edge
ct - ctenidium
dasg - duct of accessory salivary gland
dg - digestive gland
dgL - duct of gland of Leiblein
fp - pouch of foot
gL - gland of Leiblein
gon - gonad
hg - hypobranchial gland
ht - head tentacles
ml - mantle lobe
nr - nervous ring
oe - oesophagus
os - osphradium
par - parapodium
per - pericardium
pmt - posterior mantle tentacle
poe - posterior oesophagus
pr - proboscis
prp - propodium
prr - proboscis retractors
re - rectum
rhd - rhynchodaeum (proboscis sheath)
s - siphon
sg - salivary gland
st - stomach
vL - valve of Leiblein

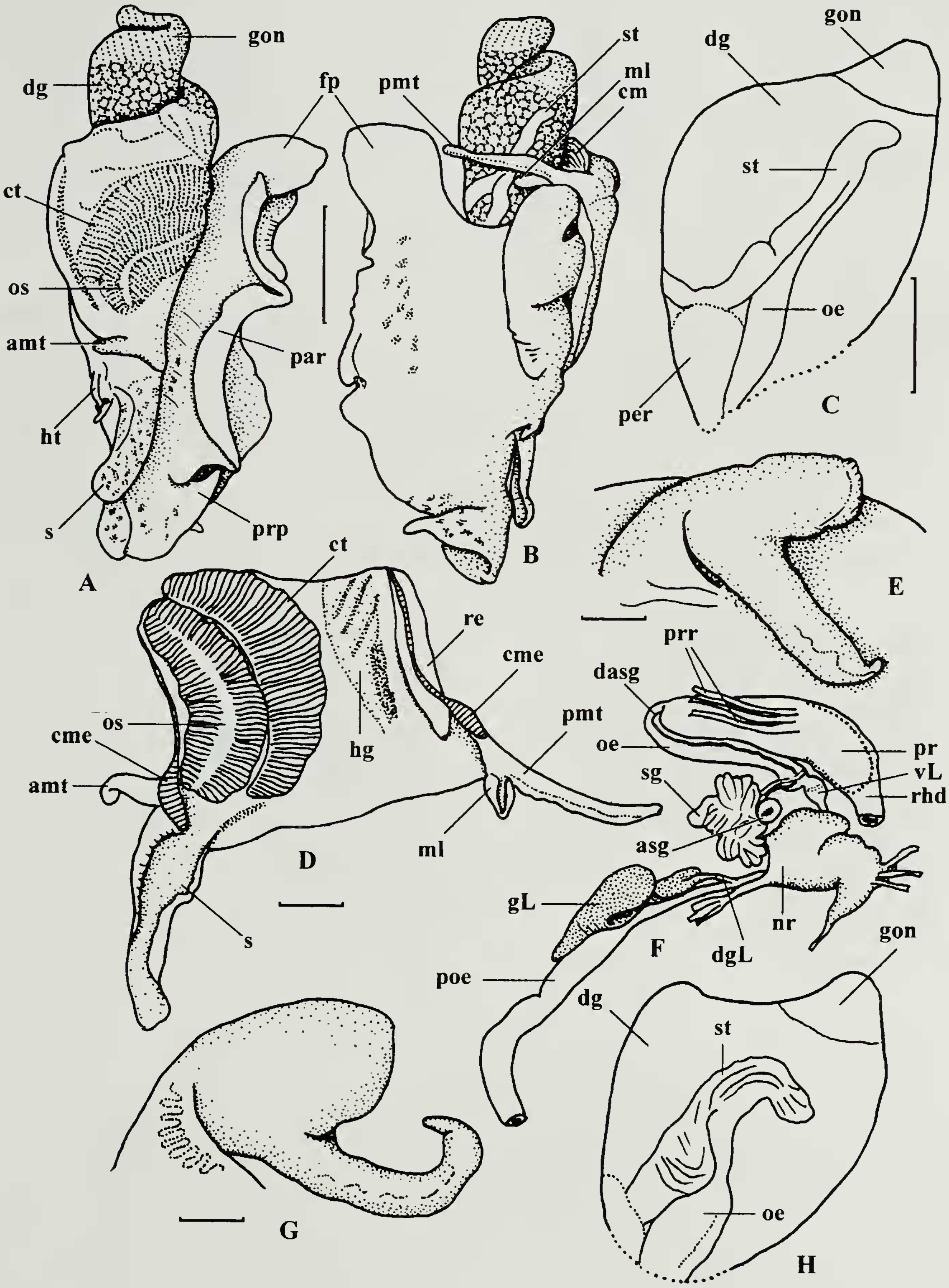


Plate 6. *Oliva ouini* sp. nov.

Plate 7. Anatomy of a female of *Oliva ouini* sp. nov., (H: 13.9 mm).
Scale bars: A, B, C, E - 2 mm; F, G, H - 1 mm.

A, B - body removed from the shell.
C - ventral view of the foot, showing the ventral pedal gland.
D - enlarged dorsal view of the head with proboscis protruded.
E - cut-out mantle.
F - view of visceral mass, showing the shape of stomach.
G - stomach from inner side.
H - anterior part of digestive system, from the right side, extended.

amt - anterior mantle tentacle
asg - accessory salivary gland
cme - cut mantle edge
ct - ctenidium
dasg - duct of accessory salivary gland
ddg - duct of digestive gland
dg - digestive gland
dgL - duct of gland of Leiblein
fp - pouch of foot
gL - gland of Leiblein
gon - gonad
hg - hypobranchial gland
ht - head tentacles
ml - mantle lobe
nr - nervous ring
oe - oesophagus
os - osphradium
par - parapodium
pgon - pallial gonoduct
pmt - posterior mantle tentacle
poe - posterior oesophagus
pr - proboscis
prp - propodium
re - rectum
s - siphon
sg - salivary gland
st - stomach
vL - valve of Leiblein
vpg - ventral pedal gland.

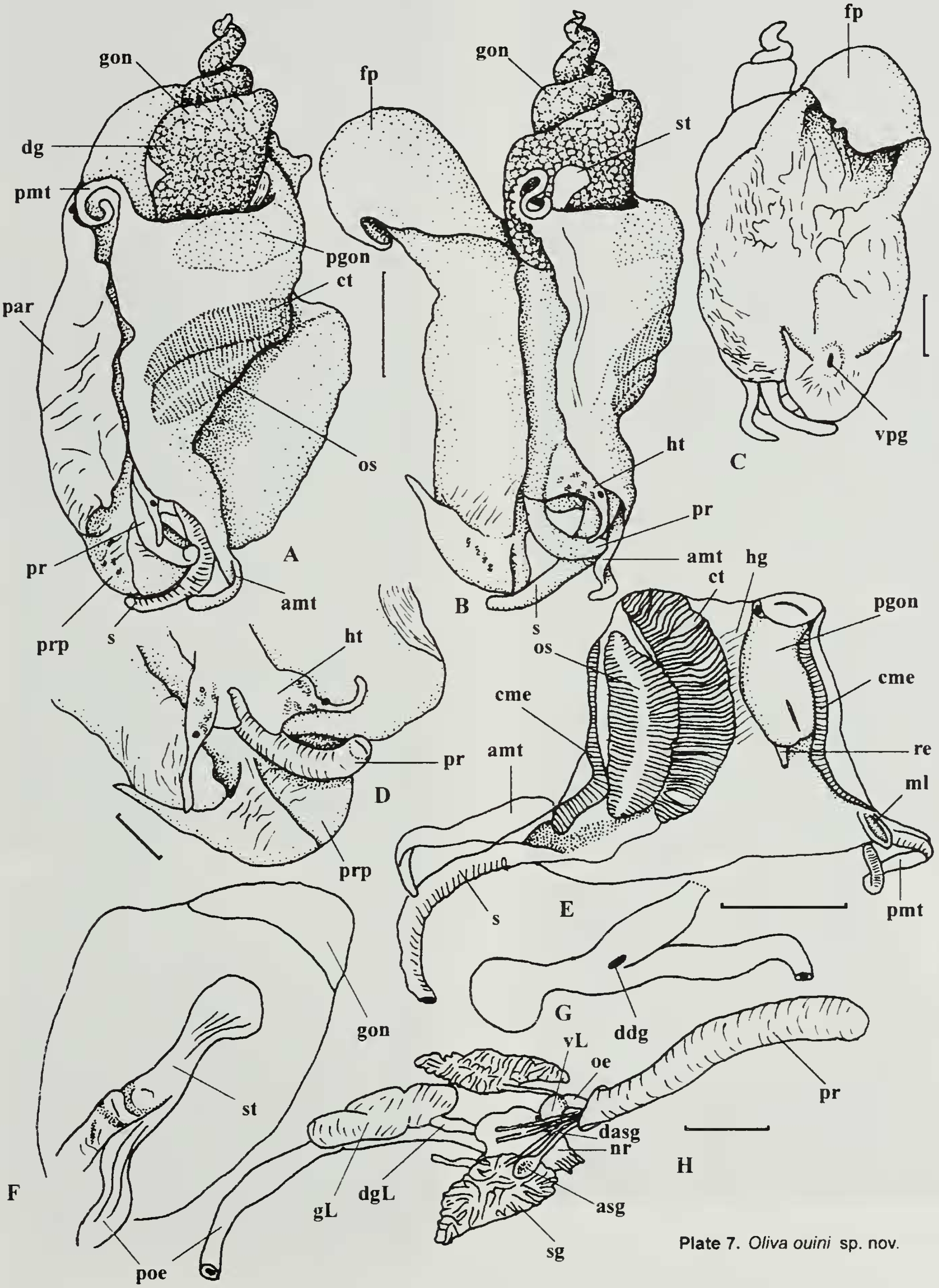


Plate 7. *Oliva ouini* sp. nov.

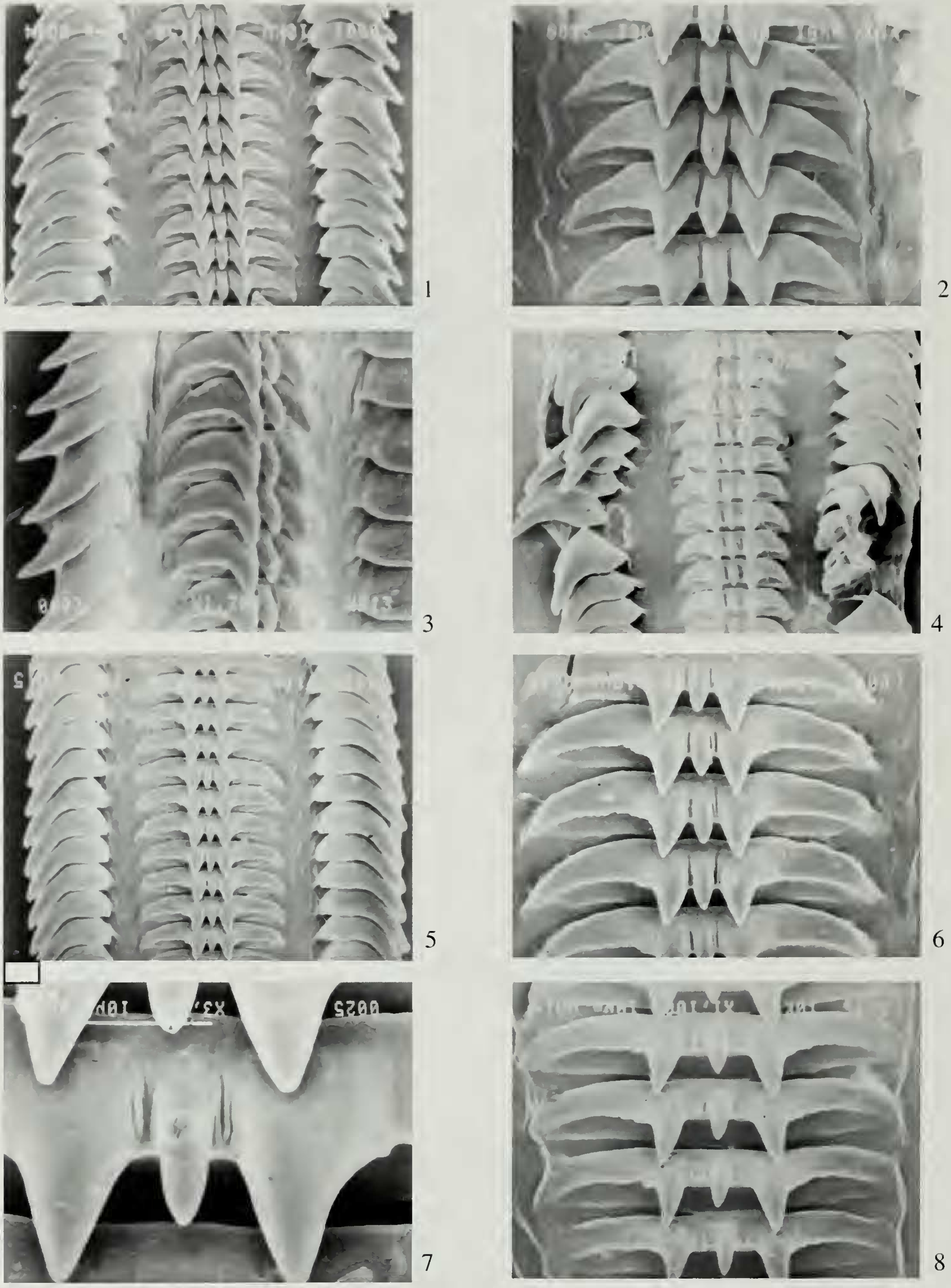


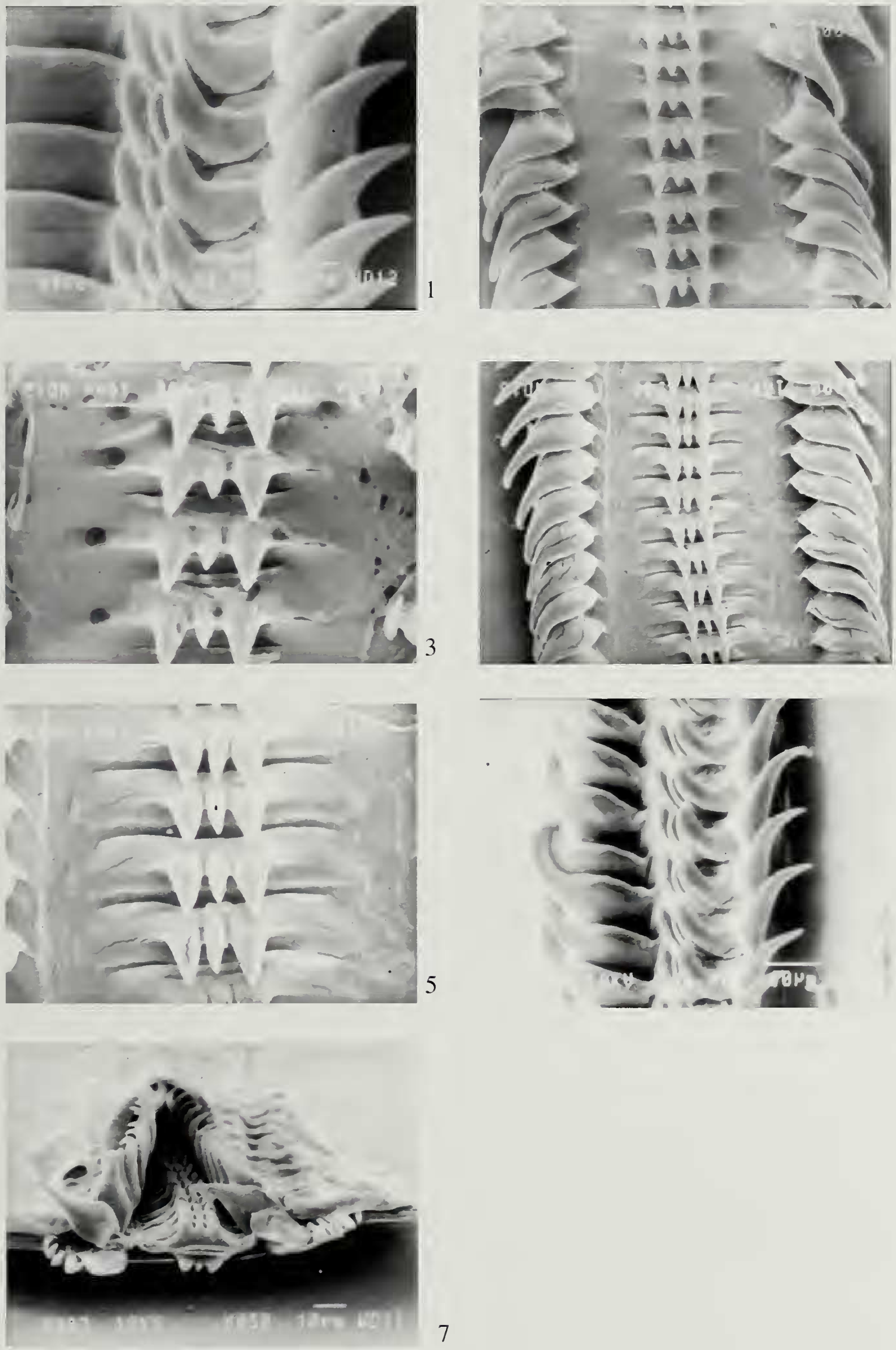
Plate 8. *Oliva oliva* (L., 1758).

1-3: female, Papua New Guinea, Hansa Bay, Sisimangum (H: 11.6 mm).

4: female, Papua New Guinea, Hansa Bay, Sisimangum (H: 20.2 mm).

5-7: male, Papua New Guinea, Hansa Bay, Boro Beach (H: 27.0mm).

8: female, Papua New Guinea, Hansa Bay, Boro Beach (H: 33.4 mm).



1 2 3 4 5 6 7

Plate 9. *Oliva ouini* sp. nov. All from type locality.

1-3: female (H: 11.3 mm).

4-7: male (H: 11.6 mm).